

# CORRECT STERILIZING TECHNIQUE

FOR  
DENTISTS AND  
PHYSICIANS



WILMOT CASTLE CO.

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## Foreword

**T**HIS BOOKLET has been published to give you a better understanding of the various methods of sterilization. It has been written in consultation with the Dept. of Bacteriology of the School of Medicine and Dentistry of the University of Rochester. This publication has the approval of that department.

# **The Definite Standards of Technique Required for Correct Sterilization**



**E**VERY doctor realizes that the well-being of his patients demands safety in sterilization. His own regard for scientific accuracy, to say nothing of the protection it affords against legal action, are also pertinent factors. Correct equipment for this safety in sterilization increases his personal efficiency, creates confidence and enhances prestige.

This brochure will record a working technique for safe sterilization, practical for surgeons, physicians and dentists, for use in their offices and clinics. In making it, the authority of bacteriologists and the experience of men in practice have been sought and utilized. The scientific findings of the one group have been adapted to the practicalities of the other, with the result that the standards of sterilization herein indicated are both technically correct, and usable in daily practice.

## **Pasteur and Lister Foresaw Thoroughness in Sterilization**

The work of Pasteur and Lister in the field of micro-organisms is common knowledge. All professional men know the impetus which their pioneer work gave to the advancement of medicine and surgery.



One of the basic principles in the findings of these two pioneers was that *everything* in contact with surgical work must be sterile. An article was either sterile or it was not; and if not thoroughly sterile, it was unsafe. This conception, now accepted as a standard in sterilization, was in reality the forerunner of the modern idea of asepsis.

Advanced knowledge of micro-organisms and modern laboratory technique, combined with present day surgical skill, have revolutionized surgical procedure. Constant improvements in sterilizers, too, have played their part in increasing the heritage which Pasteur and Lister passed on for man's benefit.

Of course, the professional man of today knows the value of this inheritance. He realizes that from it have come modern sterilization methods, that it is his duty to employ them fully, and to improve them where possible. He may well ask himself occasionally whether he is taking full measure of benefit from them, whether he is practicing *full* sterilization, or whether trusting to *part* sterilization, and thereby imposing an extra heavy burden on nature herself with his patients.

### **Sterilization Has But a Single Standard**

Whatever the answer to this question, it cannot be doubted that there should be definite and accepted rules for sterilization, and that these rules should be followed to the letter. Safe sterilization should determine circumstances rather than to have circumstances determine sterilization.

### **What Is Sterilization?**

Sterilization in medical and surgical practice is the destruction of living organisms in material used.

The materials discussed here are *instruments*, *dressings* and *water*.

Bacteriological organisms are of two kinds, spore bearers and non-spore bearers. Spore bearing pathogenic bacteria are found in dirt and filth from the fields, and more rarely in the dust in the air.

Spores have a shell-like structure and are very resistant to heat. Although spores are sometimes forgotten or neglected in non-operative treatments, they nevertheless are a constant menace and the careful practitioner protects himself by taking the extra precautions necessary for their destruction. Bacteriologists have repeatedly pointed out that boiling water does not kill spores even after prolonged exposure. The safety of a technique based on boiling water only is determined by the completeness with which spore bearing organisms have been removed by mechanical means (scrubbing).

### **Temperature, Moisture and Time Are All Important Factors**

Heat without moisture can and will provide sterilization. But moisture is an important factor in sterilization, because when present it reduces the temperature necessary, and lessens the time required.

For example: cotton materials may be thoroughly sterilized in steam under pressure at 250° F. in 30 minutes, yet if exposed to dry heat rather than steam, the heat factor should be raised to 350° F., and the time factor increased to 60 minutes. This makes it clear that the steam autoclave is the correct apparatus for sterilizing surgical dressings, linen, etc., and that the dry hot air sterilizer should be used for sterilizing laboratory glassware (inasmuch as glass can stand the necessary high temperature).



Bacteria have widely varying thermal death points. Bacteriologists have shown, however, that when the factors outlined in the following table are complied with sterilization will be assured.

TEMPERATURE TIME MOISTURE			Determine Sterilization		
			Kills		
			Mois- ture Pres- ent	Spores and Bac- teria	Bac- teria only
Boiling Water	212°	10	Yes	No	Yes
Pressure Steam	250°-260°	*6-30	Yes	Yes	Yes
Hot Air	350°	60	No	Yes	Yes
Hot Oil	250°	6-15	No	No	Yes
Hot Oil	300°	30-60	No	Yes	Yes

\*The higher the temperature the lower the time factor. Also the smaller the load the shorter the time required for penetration. For example, in the "Speed-Clave" of small capacity, instruments may be thoroughly sterilized in 6 min., dressings in 8 min., if temperature is up to 260°F. See tables following.

Steam at 250° F. Kills Spores

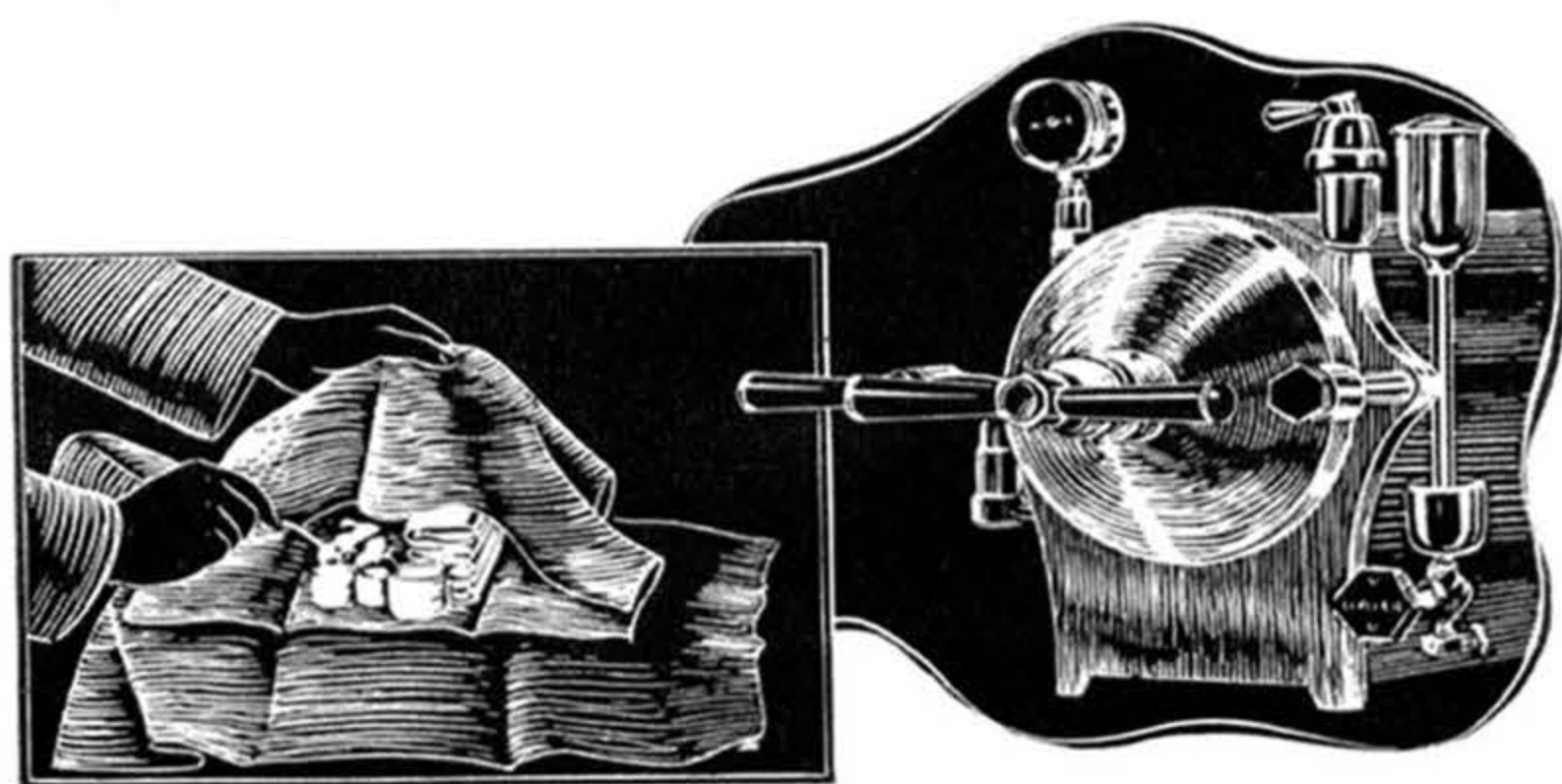
Steam at 250° F. will destroy any and all the spores that may be encountered in practice. This temperature is available only in the pressure type of equipment, because steam must be confined if its temperature is raised above the boiling point. Pressure itself is not an aid in sterilization. The increase in temperature from 212° F. to 250° F. gives the added destruc-

## PRESSURE STERILIZATION

tive power that will kill spores. The apparatus is known as an autoclave.

### Castle Autoclave

Preference for pressure sterilization of dressings by general practitioners as well as specialists has been increased by the simplicity, economy, and safety of the modern improved autoclave. It is now available in office models of suitable size. It requires no special plumbing or wiring and is fully automatic. Its results are the same as with a large hospital autoclave, i.e., spores are destroyed, air pockets eliminated, and dressings are delivered dry. It gives true hospital sterilizing safety without the annoyance of taking dressings to a hospital.



*Sterilization at 250° F. in the No. 666 Autoclave*

### Steam (Not Hot Air) Sterilizes

Steam Sterilizers, of the autoclave or pressure type, use the simplest principles of physics. The first is that steam, in order to give up its heat and sterilize, must penetrate every fibre. It must displace all air (inasmuch as dry hot air is an inefficient sterilizing medium). Air pockets must be eliminated by piston-like action of steam itself. In other words, steam must



enter the chamber at one end and drive out air at the lower side of the opposite end. This is accomplished automatically in all Castle Autoclaves.

### **Dressings Must Be Dry**

A second physical principle provides dryness of dressings. The Sterilizer must be double-walled. There must be a jacket around the sterilizing chamber through which steam circulates *before* entering the chamber. This steam jacket preheats dressings inside before steam strikes them, and therefore prevents condensation and dampness.

After autoclaving allow several minutes to elapse after “cracking” door and before door is opened. This allows latent heat to dissipate moisture.

### **Pressure Sterilization**

Distinction has been made between non-spore bearing bacteria, and spore bearers. Whenever the blood stream is exposed protection must be had against infection from tetanus, anthrax, or gas bacilli, which are spore bearers. The sterilizing facilities of a busy office or clinic should insure the same degree of safety as is demanded by hospital technique.

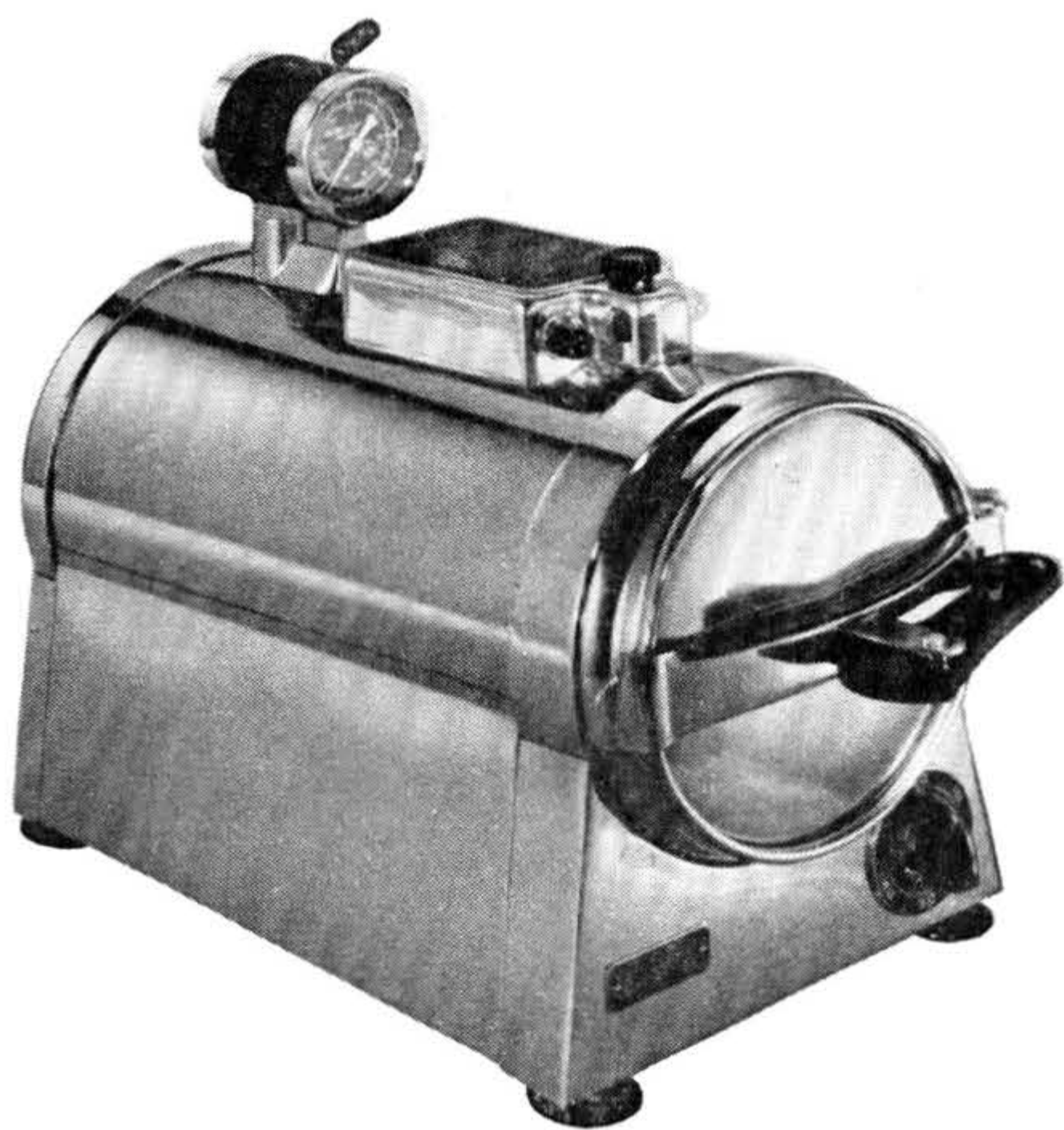
It is therefore common for general practitioners to avail themselves of the extra safety which pressure sterilization offers in the preparation of dressings and instruments used in treatment work.

A most significant aid in this accepted procedure is the development of the Speed-Clave as the all purpose office sterilizer . . . *for instruments, dressings, syringes, needles, gloves, etc.* There is nothing it won't sterilize and its process is *safer, quicker, easier and cheaper* than boiling.

**PRESSURE STERILIZATION**

**Recommended Periods  
of Exposure  
for the Castle “777” Speed-Clave**

*Temperature to be maintained  
at 250° or above*



<i>TEMPERATURE</i>		<i>PRES-</i>	<i>Instru-</i>	<i>TIME</i>	
<i>Cent.</i>	<i>Fahr.</i>	<i>SURE</i>		<i>Cotton</i>	<i>Rubber</i>
**121°	250°	15	13	20	15
123°	253°	17	10	15	—
**126½°	260°	20	6	8	—

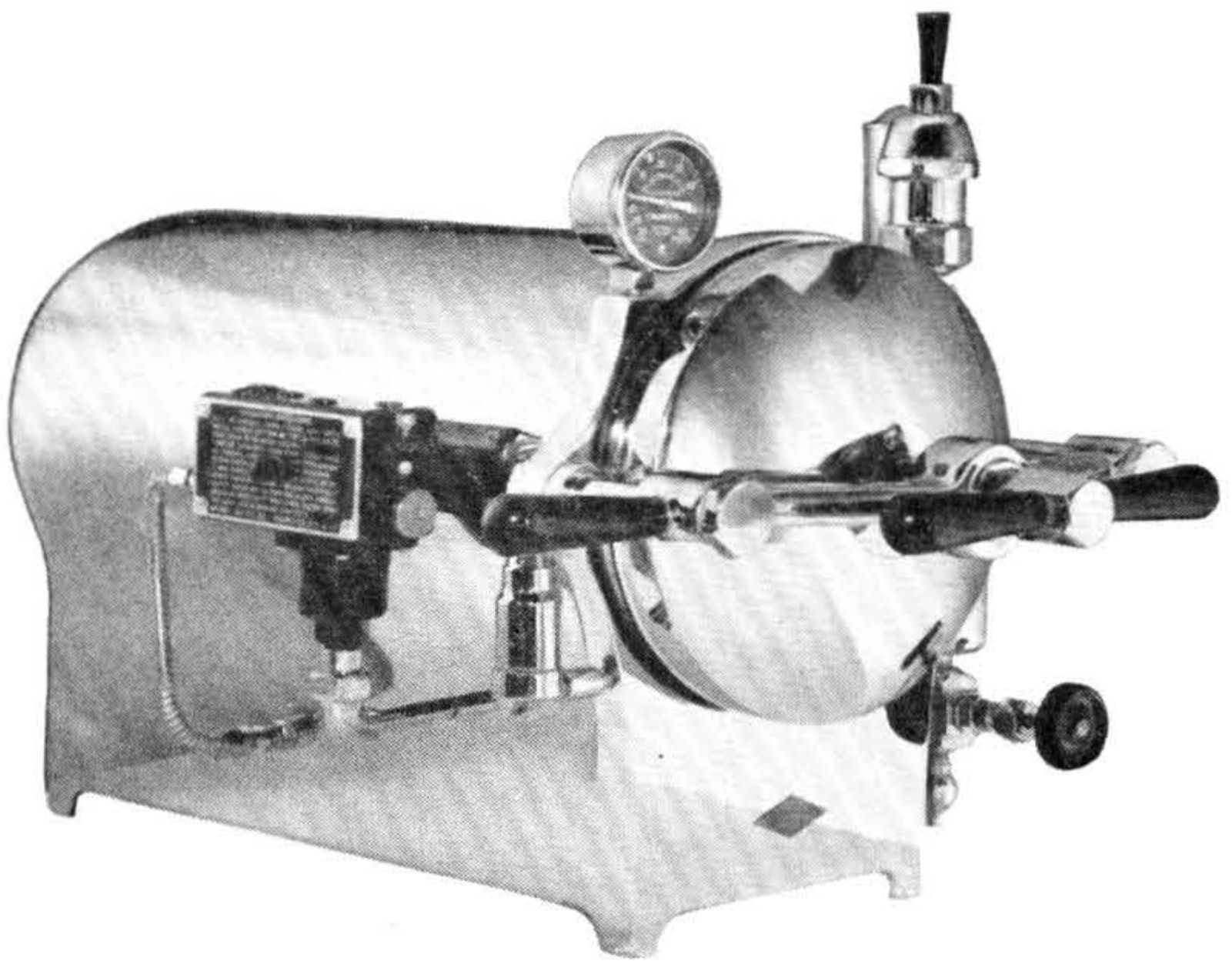
\*\*Recommended Temperatures and Time Periods.  
(These times are less than usual because these small quantities of materials require less time for steam penetration, and heating.)



# PRESSURE STERILIZATION

## Recommended Periods of Exposure for the Castle "666" Auto-clave

*Temperature to be maintained  
at 250° or above*



	<i>at 250°</i>	<i>at 260°</i>
Fabrics loosely woven—		
Wrapped in muslin.....	30 min.	30 min.
Fabrics tightly woven—		
Wrapped in muslin.....	40 min.	30 min.
Instruments in trays, covered or wrapped.....	15 min.	10 min.
Syringe and needles —		
Covered or wrapped.....	15 min.	10 min.
*Rubber gloves.....	15 min.	—
*Brushes and miscellaneous articles wrapped.....	15 min.	—
†*Solutions 1000 c.c. flasks.....	15 min.	—

\*No other materials in Autoclave at same time.

†Do not vent steam manually.

## **DRESSING STERILIZATION**

### **An Individual Packet for Each Patient**

The only difficulty with sterilization of dry materials has been the lack of a convenient way to accomplish it. The technique described below of sterilizing dressings in Individual Packets in dry steam is a practical answer to the problem. Each patient will have his or her own packet of freshly re-sterilized material. The doctor will be assured of safety and the patient will have confidence in his care.

### **Packets for Cotton Goods**

All goods should be wrapped in the form of a packet. This is done by placing goods in the center of a square sheet of double thickness muslin or an absorbent material. Fold lower corner, then right corner and then left-hand corner. Bring upper corner across top of entire pack and insert end in flap between folded end corners and-or use safety pin.

### **Prevent Contamination from Other Cases**

*For Physicians:* Fold into a 12-inch square of muslin an assortment of gauze, cotton, applications, bandage, etc., as may be required for any office treatment case.

*For Dentists:* Use a 10-inch square of muslin, placing in it enough rolls, points, pellets, pledgets, and cotton for any kind of case.

Fold and pin the above into a "compress" as in a hospital. Sterilize a dozen of these each morning (or enough for the day's work).



## DRESSING STERILIZATION



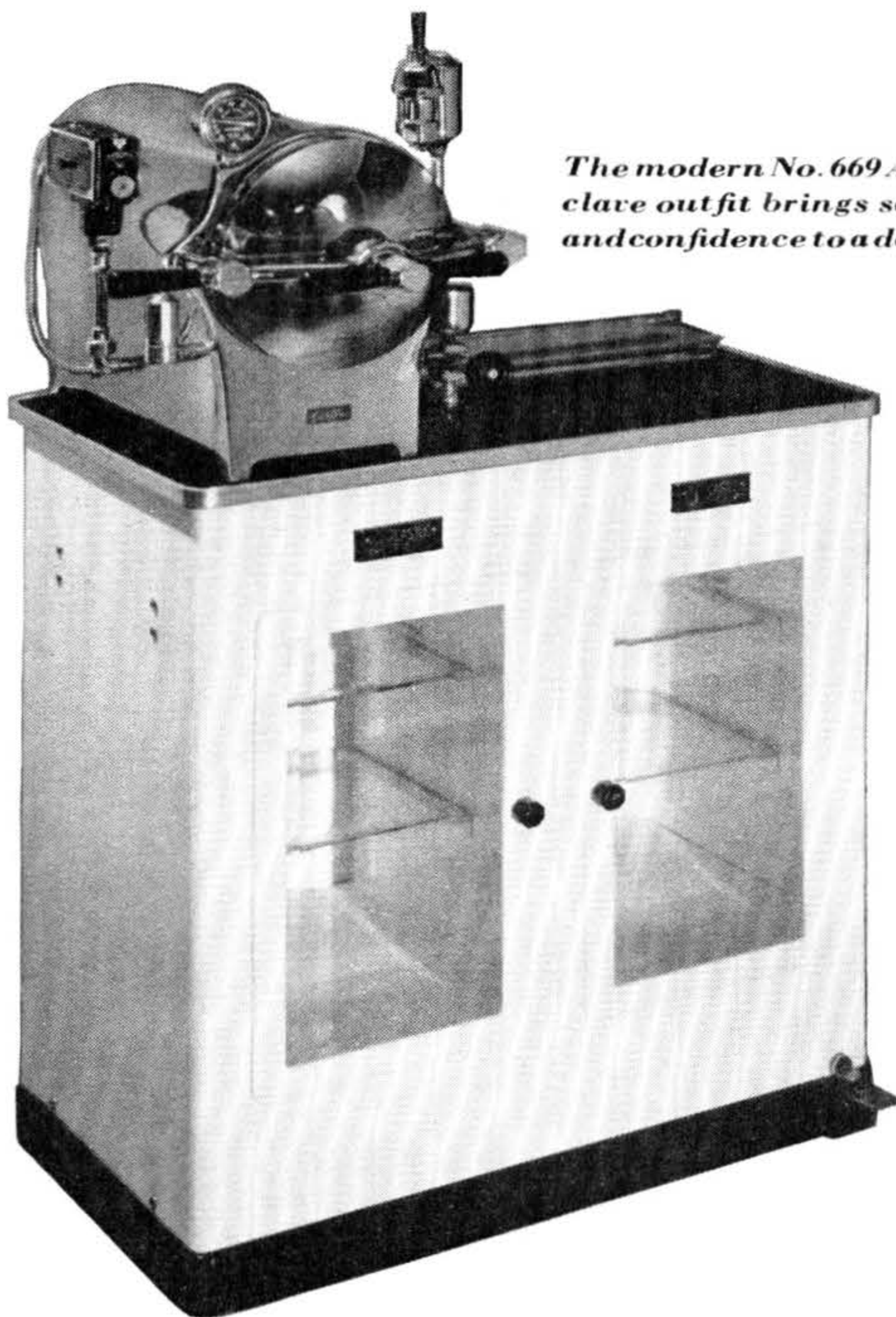
*Taking cotton materials from the sterilized packet directly to the patient adds safety to your practice*

After the patient is seated, remove one packet from the sterilizer, unpin, lift flap, and use directly from the packet to the patient. This prevents possibility of contamination *from other cases*.

After treatment, lay aside the partly used packet, later replenish, and re-sterilize next day. This prevents waste, is practical, and gives true sterilizing protection that is appreciated.

The packets of absorbent material should be placed lightly and irregularly on tray.

## PRESSURE STERILIZATION OF INSTRUMENTS



*The modern No. 669 Autoclave outfit brings safety and confidence to a doctor*

### **Autoclaving of Instruments**

There is less corrosion of instruments and less dulling of sharp edges if instruments are autoclaved rather than boiled. Also joints of forceps etc. do not become fouled with lime in an autoclave as they do in boiling. Hence they are easier to use and last longer.

Cover the bottom of tray with towel or absorbent material. Then place lightly wrapped instruments on the towel and cover with another piece of absorbent material. After autoclaving the handling of a wrapped pack of instruments will absorb any excess moisture thereon and they can be then carried in sterile condition to the operating area.



# PRESSURE STERILIZATION OF WATER

## Rust Prevention

After autoclaving always allow several minutes to elapse after the door is "cracked" and before door is opened and instruments removed. This allows latent heat to dissipate moisture.

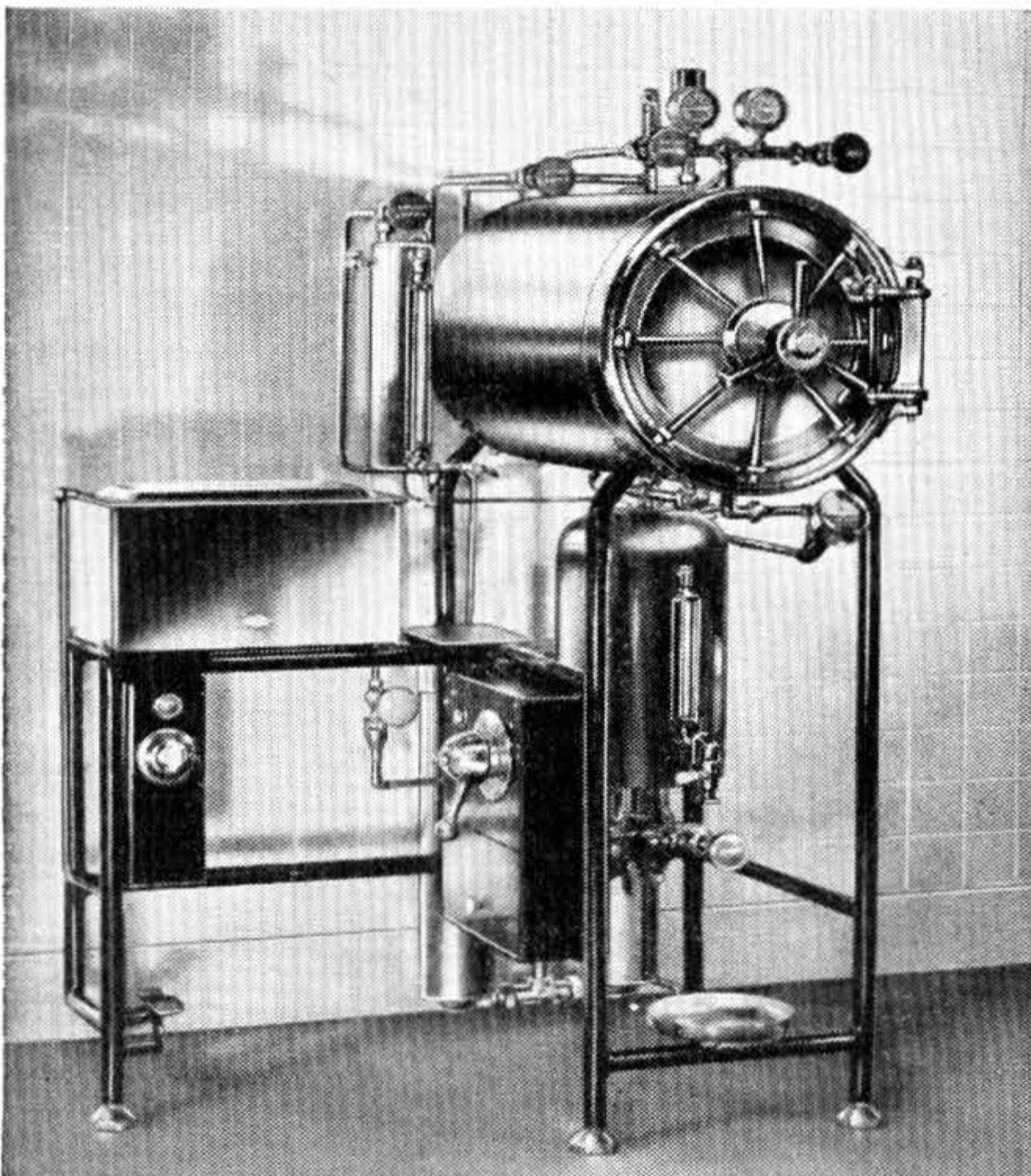
*Do not alternately boil and autoclave instruments. This accelerates corrosion.*

Do not blame the sterilizing process if old and partly plated instruments seem to rust. Corrosion may appear at points where plating is worn off.

Do not store instruments in any wrap that contains any trace of moisture.

## Sterilization of Water

It is often very important and necessary to have sterile water available for surgical treatments. Of



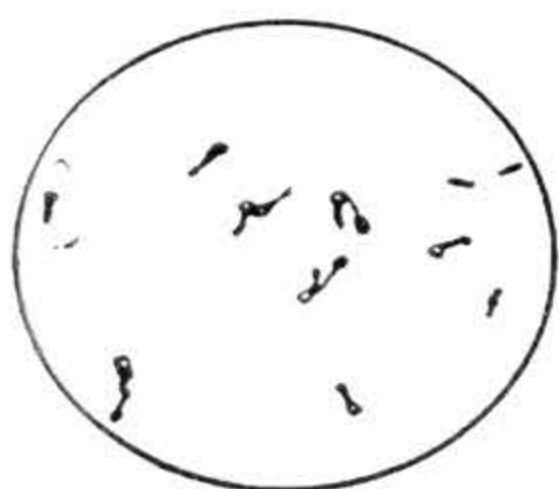
*Complete unit giving Hospital Sterilizing Technique: Autoclave, Pressure Water Sterilizer, Still, Instrument Sterilizer.*

# PRESSURE STERILIZATION OF WATER

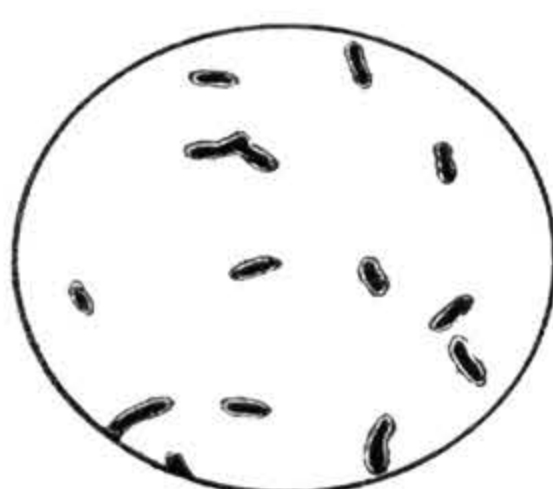
course, it is not advisable to use the water from the instrument sterilizer. A separate urn or water sterilizer may be provided which will hold three to five gallons. (See page 17 for use of distilled water in intravenous treatments.)

A water sterilizer should provide for the boiling of *all* the water simultaneously and continuously for at least 20 minutes. The gauge glass should be provided with means whereby raw, unsterilized water is not admitted to the gauge glass until after full and complete sterilization has taken place. The valve then may be turned so that sterile water shows its height in the gauge glass.

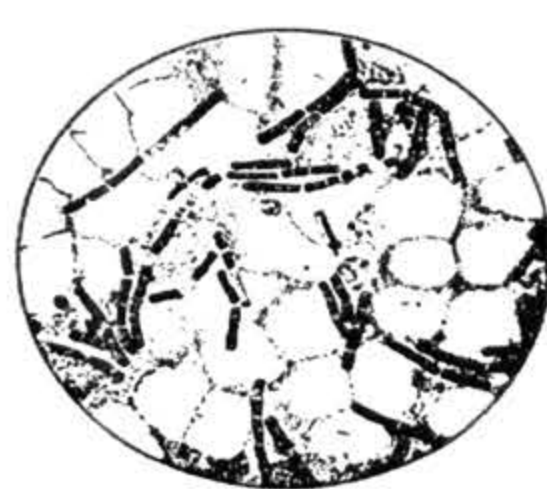
In surgery, in order that all sterilizing processes have a margin of safety, it is recommended that water be sterilized at 250°. This means boiling it for 20 minutes in a closed tank under pressure 15 to 20 pounds. Care must be taken in this process to insure the sterilization of faucet, gauge glass and drain fittings.



1. *Cl. Tetani*



2. *Cl. Welchii*



3. *B. Anthracis*

## Distilled Water Must Be Fresh

Solutions for intravenous work must be made from distilled water. Distilled water, however, that has stood for some time is certain to contain growths, even in a sealed container. Therefore, it is essential that distilled water for this work be never more than twelve hours old. After distilling, it should be placed



## NON-PRESSURE INSTRUMENT STERILIZATION

in a freshly sterilized container and carefully corked.

Care should be taken in the flushing out of the inside of the still with live steam under pressure so that the gauge glass, faucet and fittings are thoroughly sterilized before the process of distilling begins.

### Non Pressure Sterilization

Boiling of instruments is the recognized method of sterilization if spores are not present and if the blood stream is not exposed in the treatment work.

#### Full Automatic Control an Aid

The sterilizer should be held accurately at the sterilizing temperature. *Full Automatic Heat Control*



*"Space Maker" No. 70*

## STERILIZATION BY BOILING

gives assurance of this. It regulates the heat so that just enough current is used to maintain an actual sterilizing temperature. It actually sterilizes when it is supposed to.

With older types of sterilizers the operator has to manipulate a 3-heat switch to secure correct temperature. Frequently he may leave it on "low," with the dangerous assumption that it will sterilize. This danger is avoided with *Full Automatic Sterilizers*.

### Boiling of Instruments

If the following precautions are taken in the preparation and sterilization of instruments, corrosion will be minimized. The technique is exact and precise and should be followed carefully.

1. Instruments should not be allowed to stand after use without being cleaned.
2. Blood clots or other forms of moisture will stain the instruments if not scrubbed off immediately with soap and water and a brush. This cleaning of crevices in instruments by the brush is highly important.
3. Instruments that are scrubbed and known to be free from spores may be boiled. Water must be boiling when instruments are placed in it, and must be kept boiling vigorously for at least 10 minutes.

Instruments from "dirty" cases or that are suspected of bearing spores should be held in steam at 250° F. for fifteen minutes (in an autoclave).

4. At the end of this period, instruments should be taken out immediately.



5. They should be rolled from the tray onto a clean, dry, sterile towel without touching them with the hands. The towel should be picked up from underneath and the instruments wiped. The towel absorbs excess moisture and the heat of the instruments drives off the minute particles of moisture.
6. Instruments should then be put away in a tight cabinet.
7. Exact technique calls for re-sterilization just before use.

### **Sterile Tray Handles Necessary**

There is little use of sterilizing instruments if, in the process of sterilization, the chain of aseptic technique is broken by infecting the hands or the instruments by bacteria that may be on tray handles or the operating lever of the sterilizer. A Castle sterilizer combines cover and tray lift so that pressure of the foot or elbow will raise the cover and tray simultaneously. This obviates the necessity of touching the lifting lever or tray handles with hands that may be infected by bacteria from another patient.

### **Rusting Can Be Prevented**

Rust will not appear on instruments if the doctor uses the same care in sterilizing them that he uses in handling his razor at home. As stated above, they should be sterilized for 10 minutes, no longer and no less, and should receive attention immediately thereafter. Allowing the instruments to rest in water or in an elevated tray over boiling water is very harmful to them. Sodium Bicarbonate may be used as a deterrent to rust but it is not a thorough preventive. (See "Sterilizer Tablets").

### Lime May Be Removed

Lime or scale will form on the inside of any sterilizer when hard water is used. The best way to prevent this is the use of distilled water or rain water. This, however, is frequently not available and the best way to avoid lime is to clean the sterilizer every day. The water should be withdrawn and the inside of the sterilizer scrubbed with a brush and wiped.

The same daily care in the cleaning of a sterilizer that is given to cooking utensils in one's home will obviate the formation of scale. If, however, scale does form through inattention, the sterilizer should be filled with a 10% solution of muriatic acid at *room temperature* (do not boil) and allowed to stand until scale has been softened—so it can be scrubbed out with a stiff brush. Then drain solution, rinse boiler thoroughly and wipe dry. *Do not spill solution on exterior of sterilizer or on cabinet top.*

A red coating may appear on the inside of a sterilizer through inattention to the above details. This, however is not a rusting of the sterilizer itself. It comes from the instruments themselves which are left in the sterilizer longer than the prescribed time and under the conditions warned against in the above paragraphs.

### Sterilizer Tablets

To prevent the formation of lime scale and to lessen the rusting of instruments, the use of Castle Sterilizer Tablets is recommended. A sterilizer should be thoroughly cleaned before commencing their use.





## Sterilization of Syringes

Syringes and needles should be autoclaved or boiled. The instrument boiler may be used for this, but has the disadvantage that soda or other rust preventing chemical may be present. These will leave a slight deposit on needle and syringe which is objectionable. It is better to autoclave or boil them in a small syringe sterilizer filled with pure water and used only for that purpose.

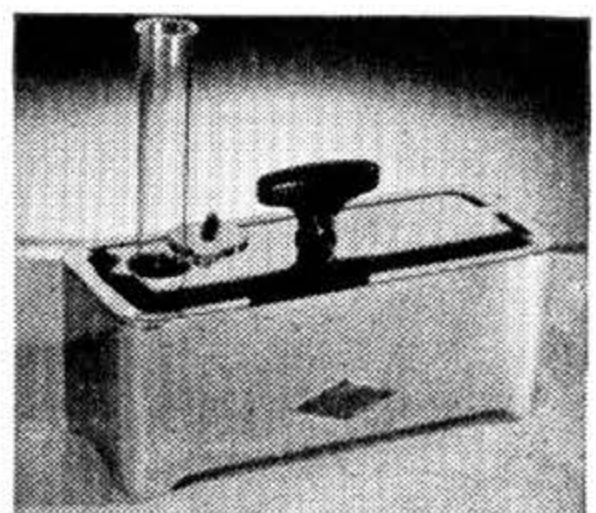
### Small Quick-boiling Sterilizer



*No. C407 Quick-boiling Sterilizer*

Every day there is need for ultra quick boiling of small instruments, as well as syringes. A small 7½" sterilizer that boils in 3 to 5 minutes is a great boon to the practitioner. Illustrated here is the quick boiling No. C407 which has a lifetime solid bronze casting, with "full and automatic" electric control.

*Test tube for urinalysis may be  
inserted thru hole in cover.*



# Sterilization of Sharp Instruments in Hot Oil

Hot oil as a sterilizing medium instead of boiling water is recommended for sharp-edged instruments. Its use is especially urged in hospital surgeries.

Tests have shown that fine edges are broken down by the corrosive action that takes place with exposure in boiling water. Such deterioration is practically nil, however, if the instruments are immersed in hot oil. Rusting is also eliminated.



*Castle Oil Sterilizer*

Inasmuch as oil is not as effective a sterilizing agent as water, a higher temperature than 212° F. must be used. Bacteriological tests have shown that oil at 250° F. will destroy bacteria. Spores are destroyed at 300° F. For time, see page 5. An oil sterilizer must have an accurate temperature regulator and a thermometer. Heavy mineral oil is recommended for sterilization. Having a high flash point, it does not give off fumes to the extent that lighter oils will. Castle No-Odor Oil is recommended.



## **Real Benefit in Following This Technique**

Safety to your patients and to yourself is a primary factor in the success of your work. Your technique in sterilization has a most important bearing on it. Therefore, too much emphasis cannot be laid on the routine to be followed in your office. This must necessarily be under your own supervision in order that it be complete and effective.

This little book contains safe guides and we urge it be followed conscientiously.



